

Doc. Number:

- ☒ Tentative Specification
☐ Preliminary Specification
☐ Approval Specification

MODEL NO.: N133HSG
SUFFIX: DJ1

Customer:

APPROVED BY

SIGNATURE

Name / Title

Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By

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REVISION HISTORY

Version	Date	Page	Description
0.0	Jul.10, 2012	All	Spec. Ver. 0.0 was first issued.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

N133HSG-DJ1 is a 13.3" TFT Liquid Crystal Display with 30 pins eDP interface. This product supports 1920 x 1080 FHD mode and can display 16,7M colors. The backlight unit is not built in.

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	13.3 diagonal		
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1080	pixel	-
Pixel Pitch	0.1529 (H) x 0.1529 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16,777,216 (8 bit)	color	-
Transmissive Mode	Normally Black	-	-
Surface Treatment	Hard coating (3H), Anti-Glare	-	-

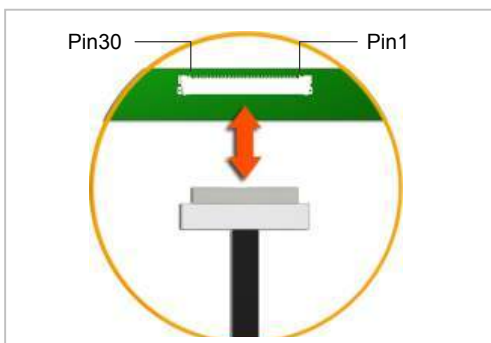
2. MECHANICAL SPECIFICATIONS

item		Min.	Typ.	Max.	Unit	Note
Size	Horizontal (H) with PCB	301.77	301.97	302.17	mm	(1) (2)
	Vertical (V) with PCB	186.44	187.44	188.44	mm	
	Vertical (V) w/o PCB	174.99	175.19	175.39	mm	
	Thickness (T) with PCB	-	-	2.0	mm	
	Thickness (T) w/o PCB	-	0.87	0.95-	mm	
Weight (with polarizer release paper)		-	115	125	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

(2) Connector mounting position

2.1 CONNECTOR TYPE



Please refer Appendix Outline Drawing for detail design.

Connector Part No.: IPEX-20455-030E-12 or equivalent

User's connector Part No: IPEX-20453-030T-01 or equivalent

2.1.2 LED Light-Bar Connector

Connector Part No.: STM MSK24022P10A or equivalent

3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

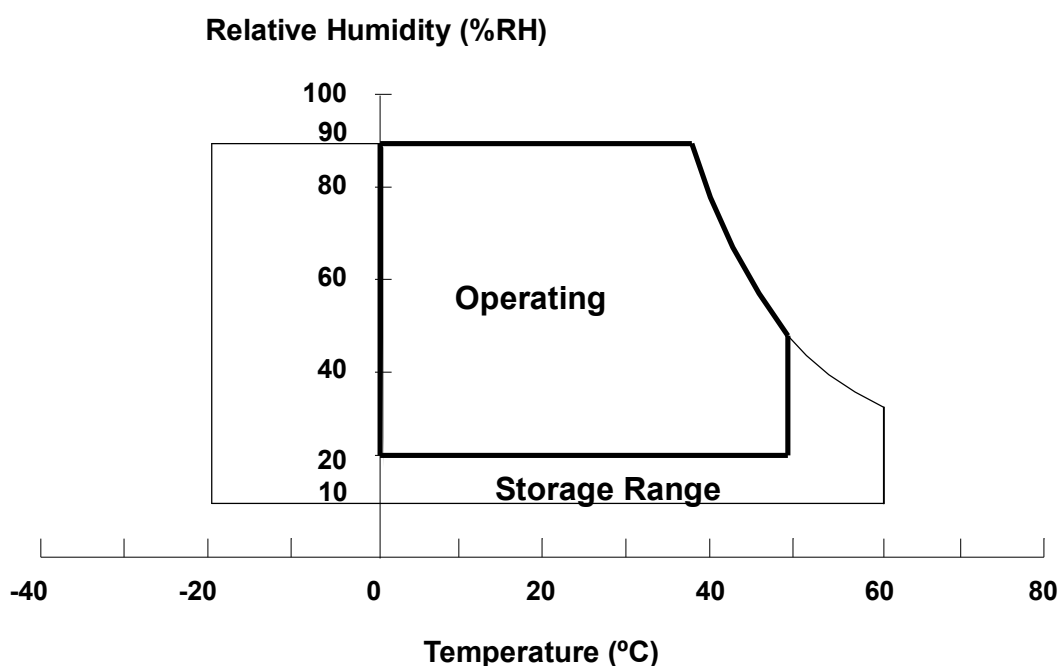
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T _{ST}	-20	+60	°C	(1)
Operating Ambient Temperature	T _{OP}	0	+50	°C	(1), (2)

Note (1) (a) 90 %RH Max. (Ta ≤ 40 °C).

(b) Wet-bulb temperature should be 39 °C Max. (Ta > 40 °C).

(c) No condensation.

Note (2) The temperature of panel surface should be 0 °C min. and 60 °C max.



3.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

High temperature or humidity may reduce the performance of panel. Please store LCD panel within the specified storage conditions.

Storage Condition: With packing.

Storage temperature range: 25±5 °C.

Storage humidity range: 50±10%RH.

Shelf life: 30days

3.3 ELECTRICAL ABSOLUTE RATINGS(OPEN CELL)

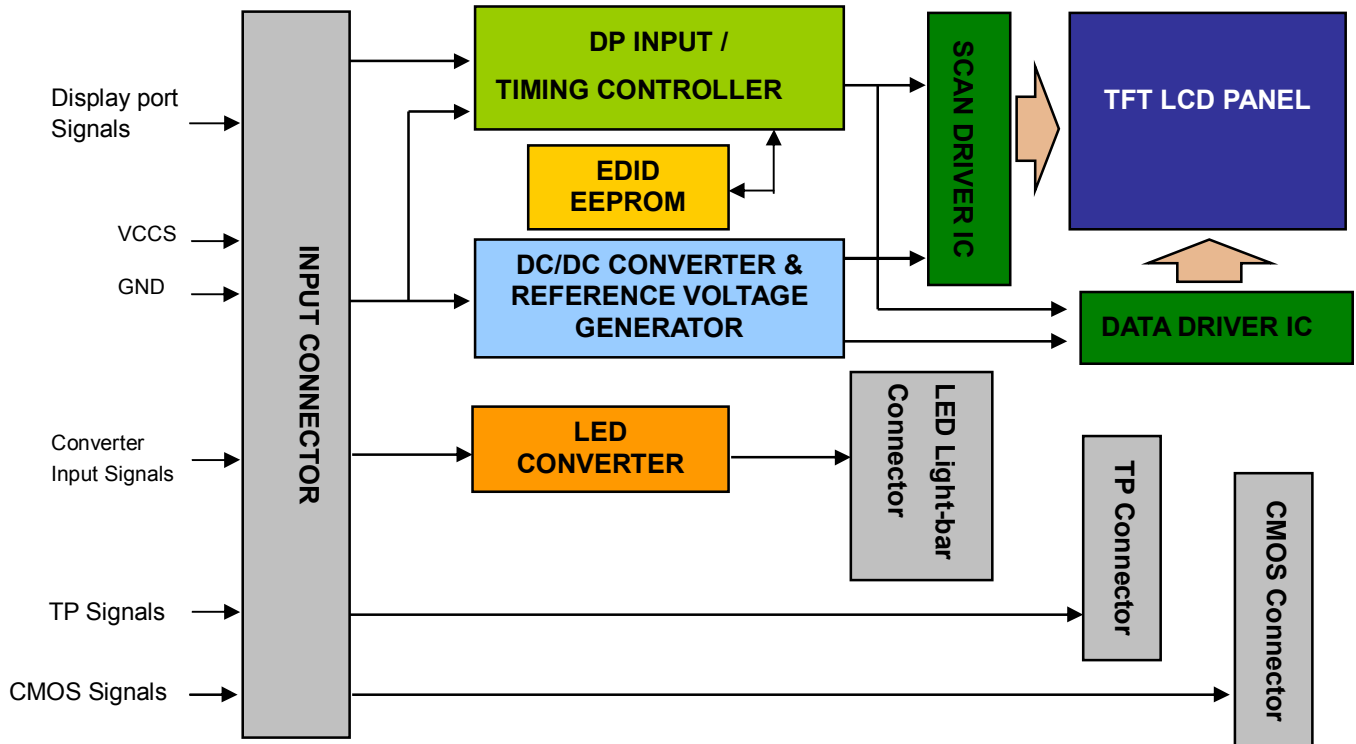
3.3.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	+4.0	V	(1)
Logic Input Voltage	V _{IN}	-0.3	VCCS+0.3	V	
System PWM signal input for dimming	PWM_IN	-0.3	5	V	
Color Engine	CE_EN	-0.3	5	V	
Dynamic backlight control	CABC_EN	-0.3	5	V	

Note (1) Stresses beyond those listed in above "ELECTRICAL ABSOLUTE RATINGS" may cause permanent damage to the device. Normal operation should be restricted to the conditions described in "ELECTRICAL CHARACTERISTICS".

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM



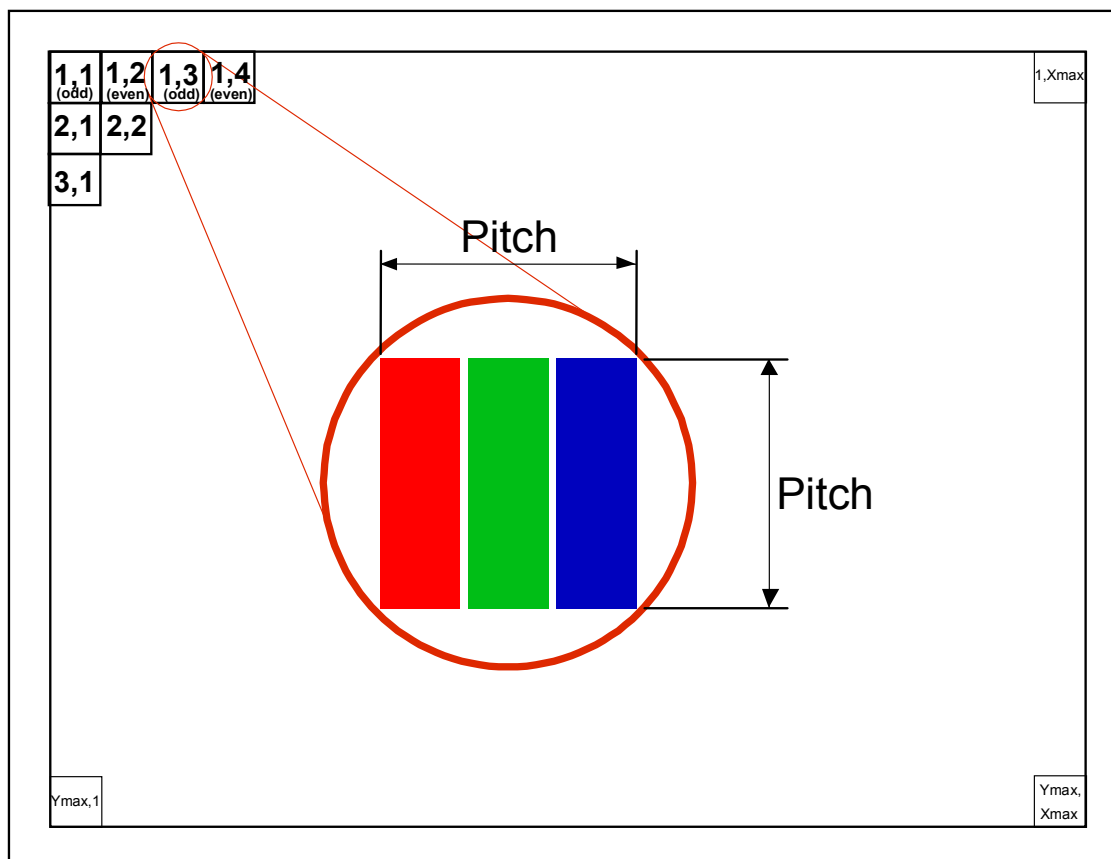
4.2. INTERFACE CONNECTIONS

PIN ASSIGNMENT

Pin	Symbol	Description	Remark
1	NC	No Connection (Reserved)	
2	H_GND	High Speed Ground	
3	LANE1_N	Complement Signal Link Lane 1	
4	LANE1_P	True Signal Link Lane 1	
5	H_GND	High Speed Ground	
6	LANE0_N	Complement Signal Link Lane 0	
7	LANE0_P	True Signal Link Lane 0	
8	H_GND	High Speed Ground	
9	AUX_CH_P	True Signal Auxiliary Channel	
10	AUX_CH_N	Complement Signal Auxiliary Channel	
11	H_GND	High Speed Ground	
12	VCCS	Power Supply +3.3 V (typical)	
13	VCCS	Power Supply +3.3 V (typical)	
14	BIST	LCD Panel Self Test Enable	
15	GND	Ground	
16	GND	Ground	
17	HPD	Hot Plug Detect	
18	BL_GND	Backlight Ground	
19	BL_GND	Backlight Ground	

20	BL_GND	Backlight Ground	
21	BL_GND	Backlight Ground	
22	LED_EN	Backlight Enable Signal of LED Converter	
23	LED_PWM	PWM Dimming Control Signal of LED Converter	
24	NC	No Connection (Reserved)	
25	NC	No Connection (Reserved)	
26	LED_VCCS	Backlight Power	
27	LED_VCCS	Backlight Power	
28	LED_VCCS	Backlight Power	
29	LED_VCCS	Backlight Power	
30	LOGO_VCCS	LOGO LED Power Supply +5V, (typical)	

Note (1) The first pixel is odd as shown in the following figure.



4.3 ELECTRICAL CHARACTERISTICS

4.3.1 LCD ELETRONICS SPECIFICATION

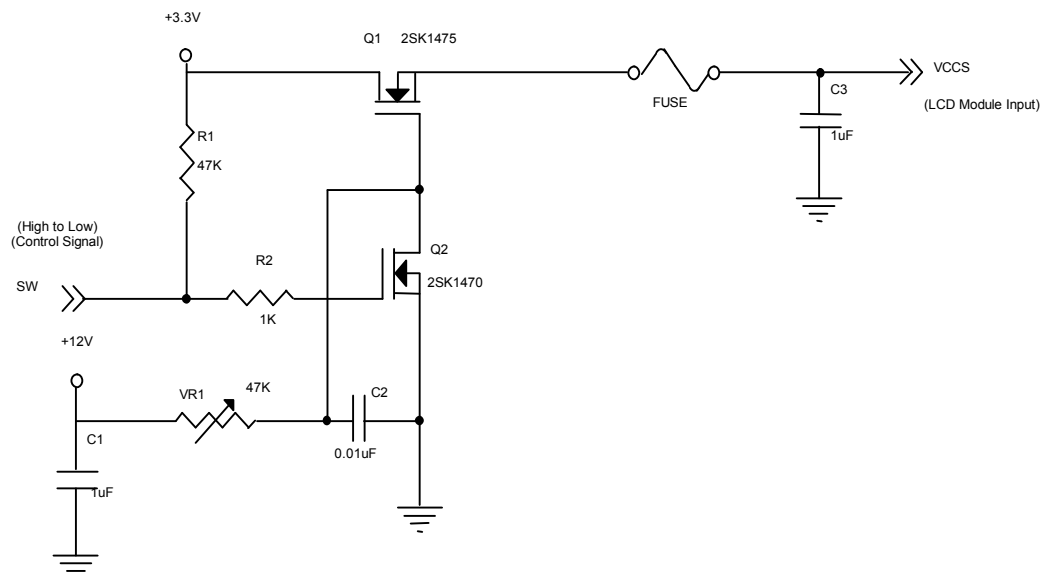
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VCCS	3.0	3.3	3.6	V	(1)-
HPD	High Level		3.0	-	3.6	V	
	Low Level		0	-	0.4	V	
Ripple Voltage		V _{RP}	-	50	-	mV	(1)-
Inrush Current		I _{RUSH}	-	-	1.5	A	(1),(2)
Power Supply Current	Mosaic	I _{CC}		(343)	(376)	mA	(3)a
	White			(408)	(448)	mA	(3)b

Note (1) The ambient temperature is $T_a = 25 \pm 2 \text{ }^{\circ}\text{C}$.

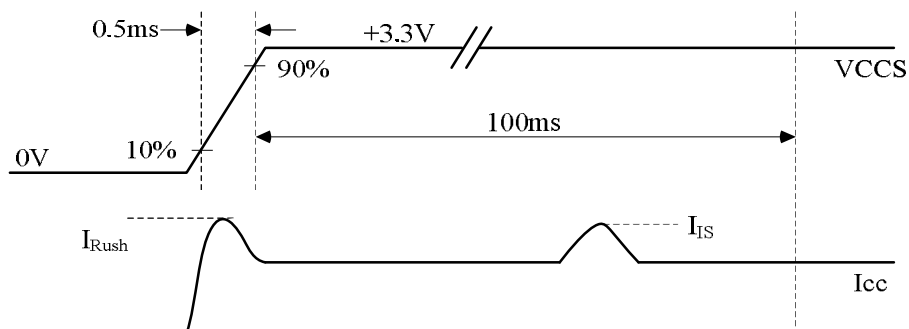
Note (2) I_{RUSH}: the maximum current when VCCS is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure. Test pattern: black.

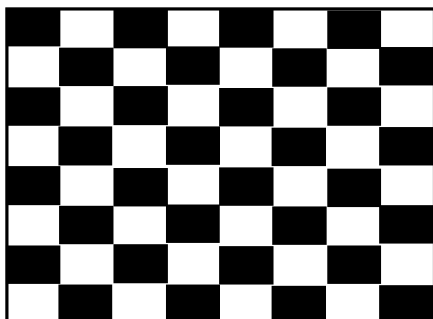


VCCS rising time is 0.5ms



Note (3) The specified power supply current is under the conditions at $V_{CCS} = 3.3\text{ V}$, $T_a = 25 \pm 2\text{ }^{\circ}\text{C}$, DC Current and $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. Mosaic Pattern



Active Area

b. White Pattern



Active Area

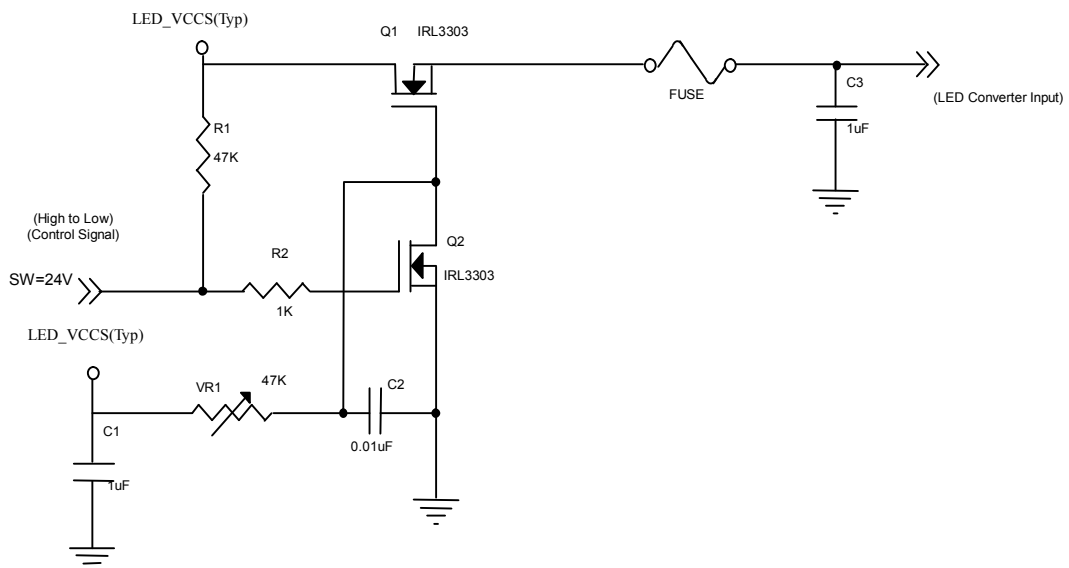
4.3.2 LED CONVERTER SPECIFICATION

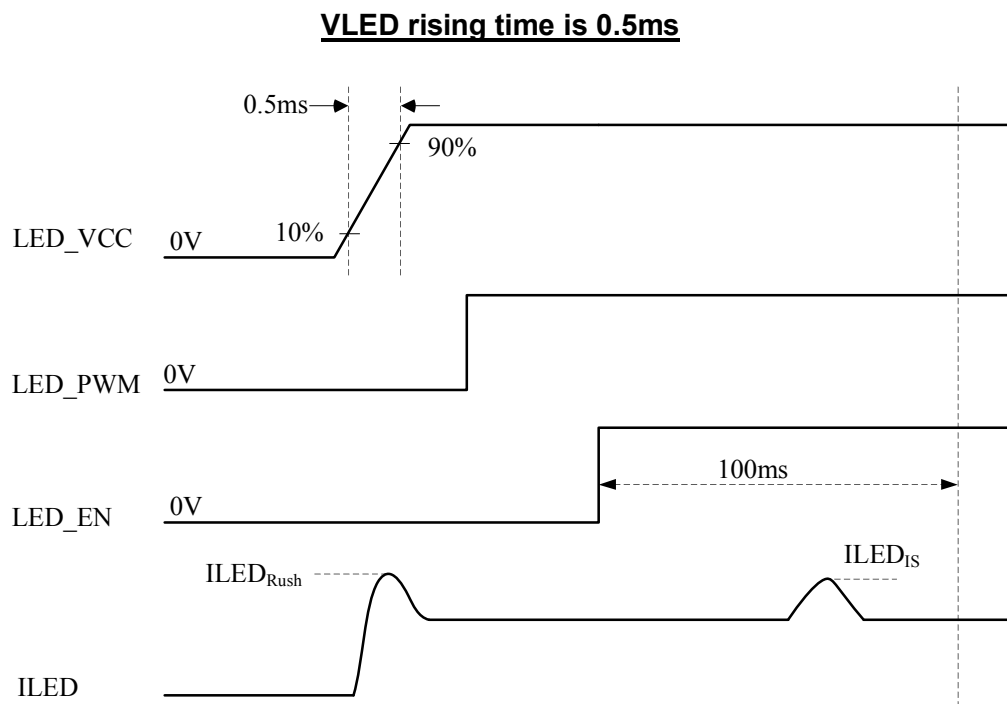
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Input power supply voltage		LED_Vccs	(7.0)	12.0	21.0	V	
Converter Inrush Current		ILED _{RUSH}	-	-	1.5	A	(1)
EN Control Level	Backlight On		2.3	-	5.0	V	
	Backlight Off		0	-	0.5	V	
PWM Control Level	PWM High Level		2.3	-	5.0	V	
	PWM Low Level		0	-	0.5	V	
PWM Control Duty Ratio			10	-	100	%	
			5	-	100	%	(2)
PWM Control Permissive Ripple Voltage		VPWM _{pp}	-	-	100	mV	
PWM Control Frequency		f _{PWM}	190	-	2K	Hz	(3)
LED Power Current	LED_VCCS =Typ.	ILED	(293)	(329)	(429)	mA	(4)

Note (1) ILED_{RUSH}: the maximum current when LED_VCCS is rising,

ILED_{IS}: the maximum current of the first 100ms after power-on,

Measurement Conditions: Shown as the following figure. LED_VCCS = Typ, Ta = 25 ± 2 °C, f_{PWM} = 200 Hz, Duty=100%.





Note (2) If the PWM control duty ratio is less than 10%, there is some possibility that acoustic noise or backlight flash can be found. And it is also difficult to control the brightness linearity.

Note (3) If PWM control frequency is applied in the range less than 1KHz, the “waterfall” phenomenon on the screen may be found. To avoid the issue, it’s a suggestion that PWM control frequency should follow the criterion as below.

PWM control frequency f_{PWM} should be in the range

$$(N + 0.33) * f \leq f_{PWM} \leq (N + 0.66) * f$$

N : Integer ($N \geq 3$)

f : Frame rate

Note (4) The specified LED power supply current is under the conditions at “LED_VCCS = Typ.”, $T_a = 25 \pm 2^\circ\text{C}$, $f_{PWM} = 200\text{ Hz}$, Duty=100%.

4.4 DISPLAY PORT SIGNAL TIMING SPECIFICATION

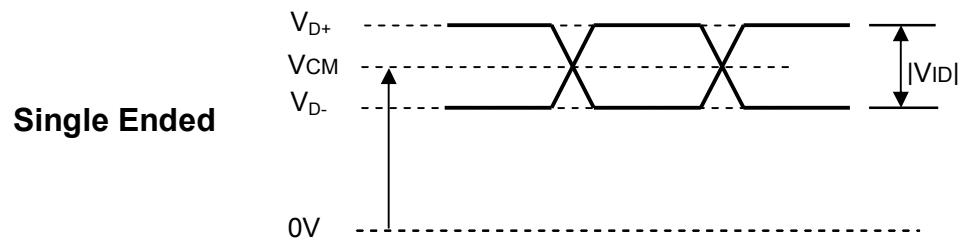
4.4.1 DISPLAY PORT INTERFACE

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Differential Signal Common Mode Voltage(MainLink and AUX)	VCM	0		2	V	(1)(3)
AUX AC Coupling Capacitor	C _{AUX}	75		200	nF	(2)

Note (1) Display port interface related AC coupled signals should follow VESA DisplayPort Standard Version1. Revision 1a and VESA Embedded DisplayPort™ Standard Version 1.1.

(2) The AUX AC Coupling Capacitor should be placed on Source Devices.

(3)The source device should pass the test criteria described in DisplayPortCompliance Test Specification (CTS) 1.1

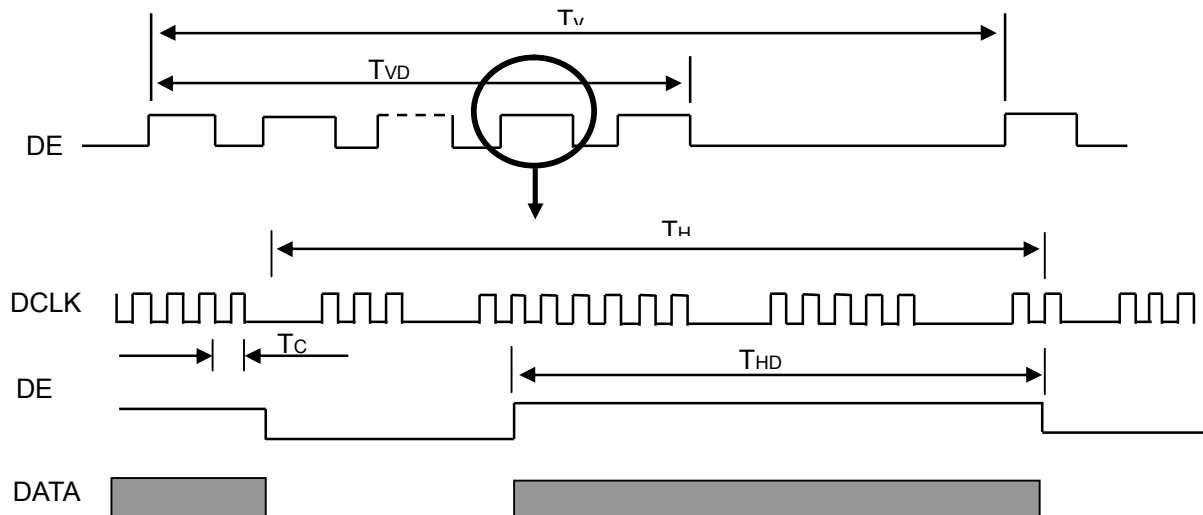


4.5 DISPLAY TIMING SPECIFICATIONS

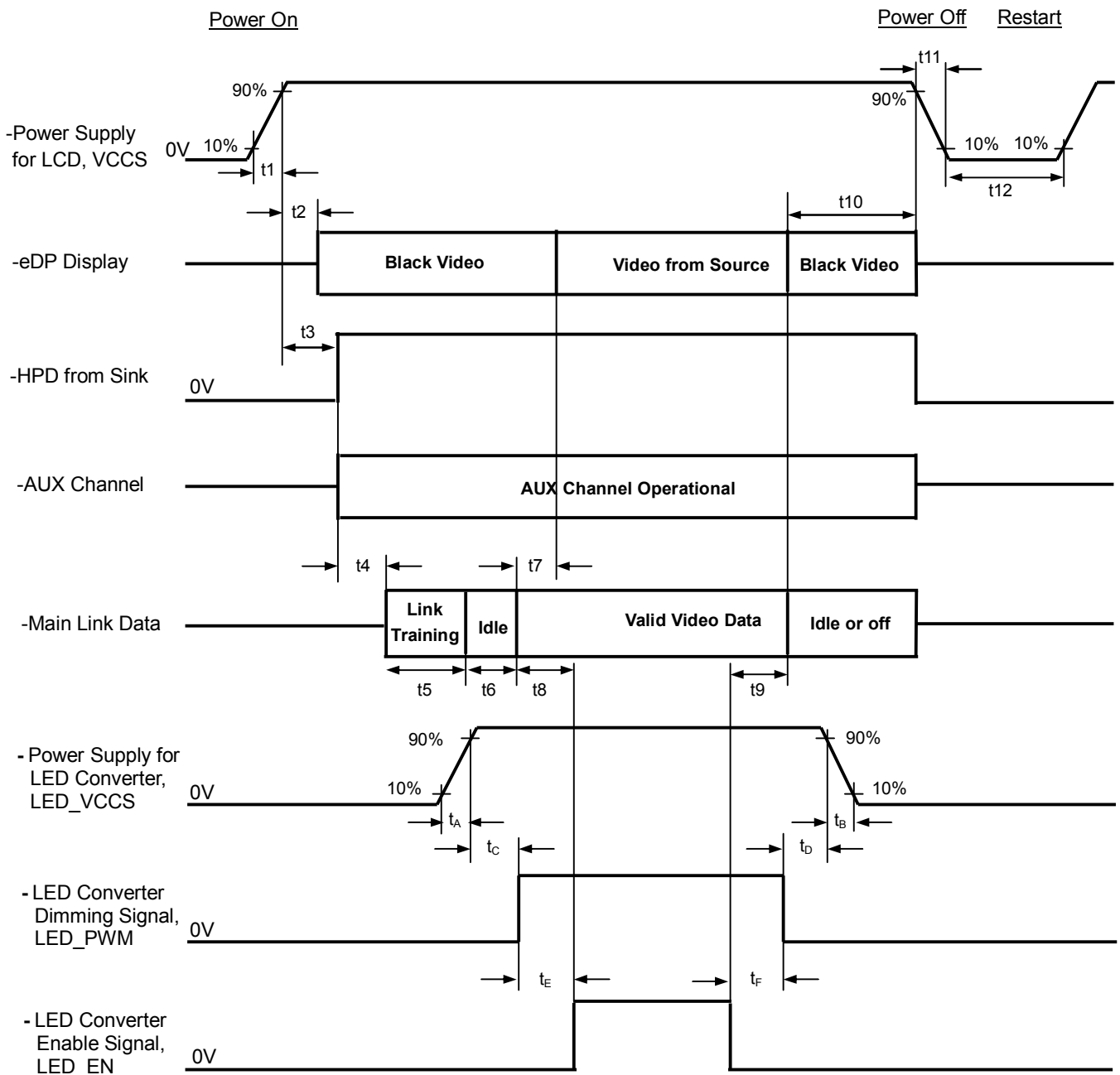
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc	(87.9)	(138.5)	(145.4)	MHz	-
DE	Vertical Total Time	TV	(1104)	(1112)	(1120)	TH	-
	Vertical Active Display Period	TVD	1080	1080	1080	TH	-
	Vertical Active Blanking Period	TVB	TV-TVD	(32)	TV-TVD	TH	-
	Horizontal Total Time	TH	(2040)	(2080)	(2120)	Tc	-
	Horizontal Active Display Period	THD	1920	1920	1920	Tc	-
	Horizontal Active Blanking Period	THB	TH-THD	(160)	TH-THD	Tc	-

INPUT SIGNAL TIMING DIAGRAM



4.6 POWER ON/OFF SEQUENCE



Timing Specifications:

Parameter	Description	Reqd. By	Value		Unit	Notes
			Min	Max		
t1	Power rail rise time, 10% to 90%	Source	0.5	10	ms	-
t2	Delay from LCD,VCCS to black video generation	Sink	0	200	ms	-
t3	Delay from LCD,VCCS to HPD high	Sink	0	200	ms	-
t4	Delay from HPD high to link training initialization	Source	-	-	ms	-
t5	Link training duration	Source	-	-	ms	-
t6	Link idle	Source	-	-	ms	-
t7	Delay from valid video data from Source to video on display	Sink	0	50	ms	-
t8	Delay from valid video data from Source to backlight on	Source	-	-	ms	-
t9	Delay from backlight off to end of valid video data	Source	-	-	ms	-
t10	Delay from end of valid video data from Source to power off	Source	0	500	ms	-
t11	VCCS power rail fall time, 90% to 10%	Source	0.5	10	ms	-
t12	VCCS Power off time	Source	500	-	ms	-
t _A	LED power rail rise time, 10% to 90%	Source	0.5	10	ms	-
t _B	LED power rail fall time, 90% to 10%	Source	0	10	ms	-
t _C	Delay from LED power rising to LED dimming signal	Source	10	-	ms	-
t _D	Delay from LED dimming signal to LED power falling	Source	10	-	ms	-
t _E	Delay from LED dimming signal to LED enable signal	Source	10	-	ms	-
t _F	Delay from LED enable signal to LED dimming signal	Source	10	-	ms	-

Note (1) Please don't plug or unplug the interface cable when system is turned on.

Note (2) Please avoid floating state of the interface signal during signal invalid period.

Note (3) It is recommended that the backlight power must be turned on after the power supply for LCD and the interface signal is valid.

5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Light Bar Input Current	I _L	---	mA

The measurement methods of optical characteristics are shown in Section 5.2. The following items should be measured under the test conditions described in Section 5.1 and stable environment shown in Note (5).

5.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 5.1 and stable environment shown in Note (6).

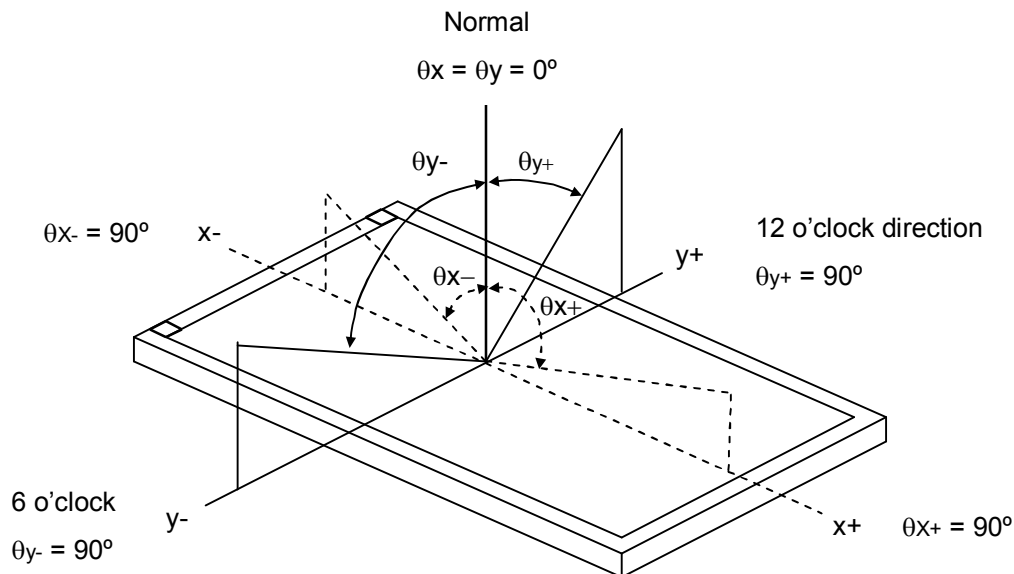
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rcx	$\theta_x=0^\circ, \theta_Y=0^\circ$ CS-2000T Standard light source “C”	Typ - 0.03	(0.664)	Typ + 0.03	-	(0),(2), (5),(8)
		Rcy			(0.327)		-	
	Green	Gcx			(0.304)		-	
		Gcy			(0.591)		-	
	Blue	Bcx			(0.142)		-	
		Bcy			(0.088)		-	
	White	Wcx			(0.333)		-	
		Wcy			(0.363)		-	
Center Transmittance		T%	$\theta_x=0^\circ, \theta_Y=0^\circ$ CS-2000T, CMO BLU	4.0	4.5			(1),(2), (5),(7)
Contrast Ratio		CR		500	700		-	(2), (3)
Response Time		T _R	$\theta_x=0^\circ, \theta_Y=0^\circ$		14	19	ms	(4)
		T _F			11	16	ms	
Transmittance uniformity		δT%	$\theta_x=0^\circ, \theta_Y=0^\circ$ BM-5A		1.25	1.43	-	(2),(6)
Viewing Angle	Horizontal	θ _x +	CR≥10 BM-5A	80	89			(2), (5)
		θ _x -		80	89			
	Vertical	θ _Y +		80	89			
		θ _Y -		80	89			

Note (0) Light source is the standard light source "C" which is defined by CIE and driving voltages are based on suitable gamma voltages. The calculating method is as following :

1. Measure Module's and BLU's spectrums. White is without signal input and R, G, B are with signal input. BLU is supplied by CMI.
2. Calculate cell's spectrum.
3. Calculate cell's chromaticity by using the spectrum of standard light source "C"

Note (1) Light source is the BLU which is supplied by CMI and driving voltages are based on suitable gamma voltages. White is without signal input and R, G, B are with signal input. Spec is judged by CMI's golden sample.

Note (2) Definition of Viewing Angle (θ_x , θ_y):



Note (3) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

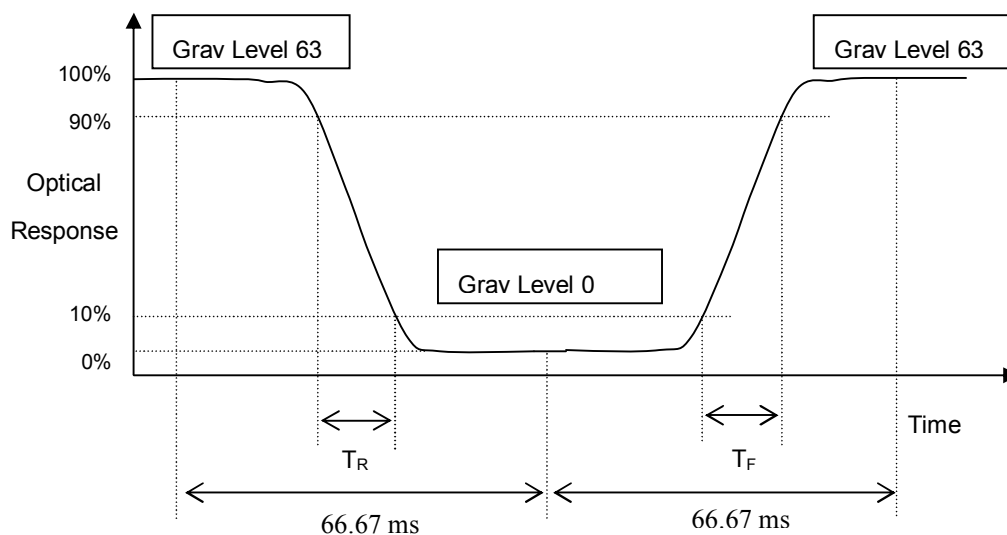
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

$$CR = CR(1)$$

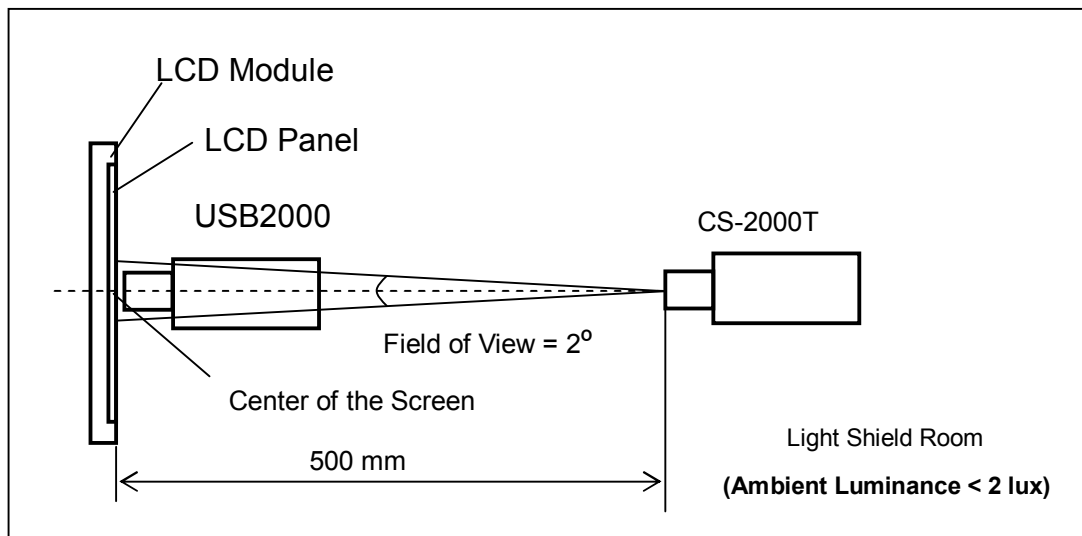
CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (4) Definition of Response Time (T_R , T_F):



Note (5) Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (6) Definition of Transmittance Variation ($\delta T\%$):

Measure the transmittance at 5 points

Maximum [$T\%(1)$, $T\%(2)$, ... $T\%(5)$]

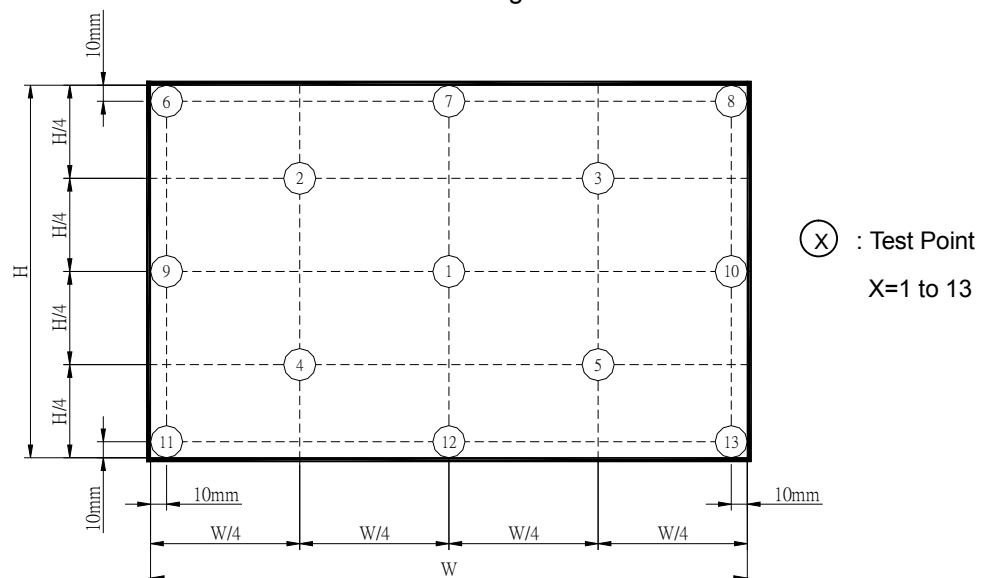
$$\delta T\% = \frac{\text{Maximum } [T\%(1), T\%(2), \dots T\%(5)]}{\text{Minimum } [T\%(1), T\%(2), \dots T\%(5)]}$$

Note (7) Definition of Transmittance ($T\%$):

Module is without signal input.

BLU is supplied by CMI.

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$



Note (8) The listed optical specifications refer to the initial value of manufacture, but the condition of the specifications after long-term operation will not be warranted.

6. PACKING

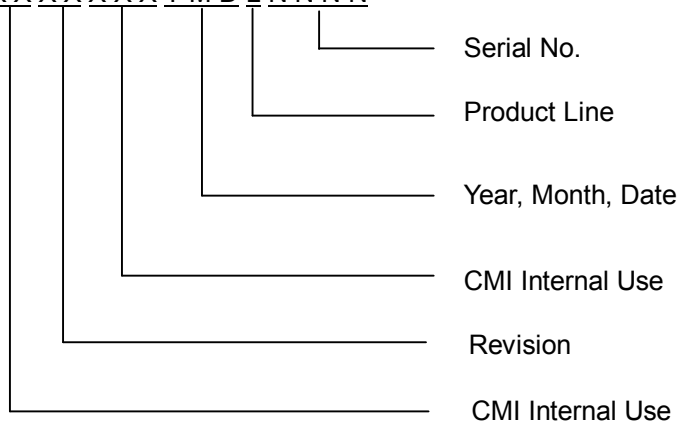
6.1 CMI OPEN CELL LABEL

The barcode nameplate is pasted on each OPEN CELL as illustration for CMI internal control.



(a) Model Name: N133HSG - DJ1

(b) Serial ID: XXXXXXYMDLNNNN



Serial ID includes the information as below:

(a) Manufactured Date: Year: 0~9, for 2010~2019

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I, O and U

(b) Revision Code: cover all the change

(c) Serial No.: Manufacturing sequence of product

(d) Product Line: 1 -> Line1, 2 -> Line 2, ...etc.

6.2 PACKAGE RELIABILITY

(1) Carton Packing should have no failure in the following reliability test items

Test Item	Test Conditions	Note
Packing Vibration	ISTA STANDARD Random, Frequency Range: 1 – 200 Hz Top & Bottom: 30 minutes (+Z), 10 min (-Z), Right & Left: 10 minutes (X) Back & Forth 10 minutes (Y)	Non Operation

6.3 CARTON

(1) Box Dimensions : 540(L)*450(W)*320(H)
(2) 40 Modules/Carton

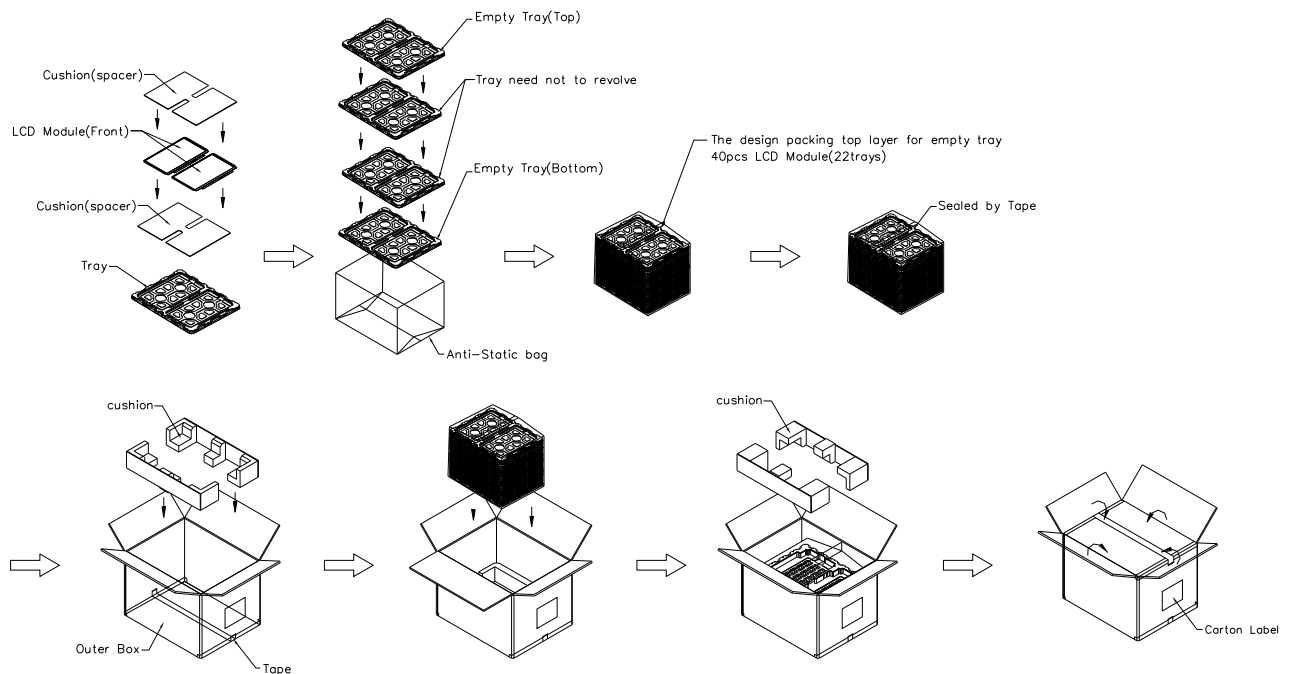


Figure. 6-3 Packing method

6.4 PALLET

Sea & Land Transportation

Air Transportation

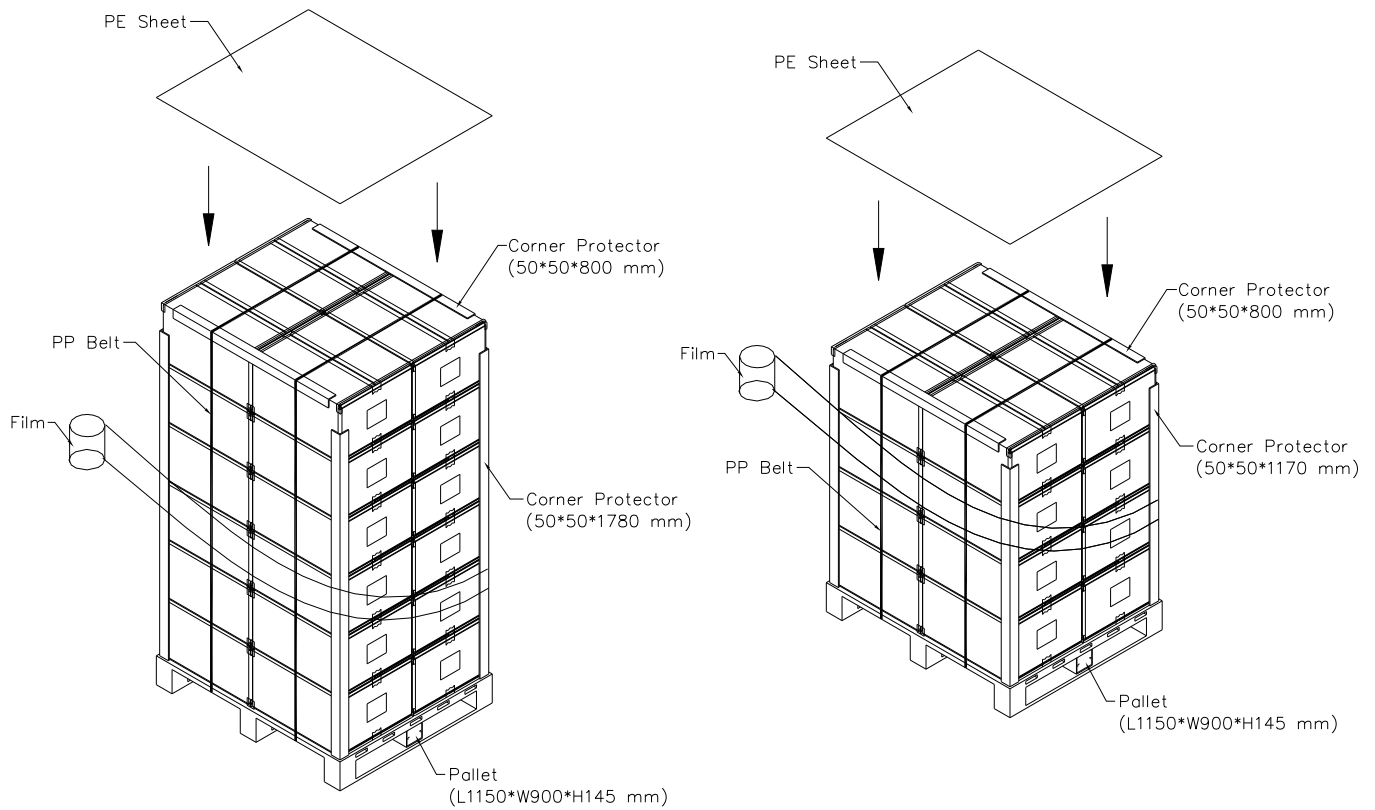


Figure. 6-4 Packing method

7. PRECAUTIONS

7.1 HANDLING PRECAUTIONS

- (1) The open cell should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the open cell.
- (2) While assembling or installing open cell, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.
- (3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.
- (5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.
- (6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.
- (8) Protect the open cell from static electricity, it may cause damage to the C-MOS Gate Array IC.
- (9) Do not disassemble the open cell.
- (10) Pins of I/F connector should not be touched directly with bare hands.

7.2 STORAGE PRECAUTIONS

- (1) High temperature or humidity may reduce the performance of open cell. Please store open cell within the specified storage conditions.
- (2) It is dangerous that moisture come into or contacted the open cell, because the moisture may damage open cell when it is operating.
- (3) It may reduce the display quality if the ambient temperature is lower than 10 °C. For example, the response time will become slowly.

7.3 OPERATION PRECAUTIONS

- (1) Do not pull the I/F connector in or out while the open cell is operating.
- (2) Always follow the correct power on/off sequence when open cell is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.

Appendix. EDID DATA STRUCTURE

The EDID (Extended Display Identification Data) data formats are to support displays as defined in the VESA Plug & Display and FPD/ standards.

TBD

Appendix. OUTLINE DRAWING

